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COORDINATING DRAFT
14 FEBRUARY 1997

OPERATIONAL REQUIREMENTS DOCUMENT
for the
FUTURE DIGITAL RADIO (FDR)

1. GENERAL DESCRIPTION OF OPERATIONAL CAPABILITY.

a. Overall Mission Area. The Future Digital Radio will operate as a system of the Command and Control (C2) Mission Area to provide a means for transport of Information Exchange Requirements (IERs) between users throughout the battlefield. Various configurations of FDR user radios will support a wide variety of users in networks that will range from low capacity voice or data nets to high capacity video links or Wide Area Networks (WANs) covering large geographic areas.

b. Type of System. The FDR system shall be comprised of a family of user owned and operated radios that will share interchangeable components to the lowest practical hardware and software levels in order to simplify configuration management and support of the system. Radios will be developed for hand-held, man-pack, surface vehicle, and air platform installations.

The FDR Open architecture design using standard commercial and military protocols will facilitate efficient and cost effective changes to system hardware and software as new technology mandates displacement of older legacy equipment and operational methods. The FDR system will be introduced in three Blocks that will be flexible enough to maintain a high degree of force readiness during the transition and adjust to unanticipated advances in technology while maintaining focus on the objective FDR system. All FDR configurations will have embedded capability for their own position location and will be configurable and/or programmable to operate in the FDR D2 WAN. The FDR system will

comply with the provisions of Department of the Army Technical Architecture and Department of Defense Joint Technical Architecture.

(1) Block I. The FDR Block I system will be the baseline Data Distribution (D2) WAN and will feature position location capability at each radio and its host. Block I will reflect current technology for high data rates in single band operation and facilitate early equipping of forces currently without adequate D2 and position location capabilities. Radios in the FDR D2 WAN will operate while moving and as initialized without need for network control stations.

(2) Block II. The FDR Block II system will be the transitional multi-band multi-mode system. Block II will retain Block I capabilities and build upon them by insertion of new technology as deemed appropriate. In order to provide the total force with an orderly transition from legacy systems to FDR while maintaining force readiness, Block II FDRs will be field configurable and programmable to emulate existing legacy radios (including FDR Block I) and directly with designated legacy systems in existing networks. The Block II FDR system will provide Multi Level Security (MLS) operation between FDR system networks of differing security levels, as defined by the individual network security policies. For example, FDR will have the capability to pass Unclassified or Sensitive But Unclassified (SBU) data between Secret high and SBU networks and to prevent the release of Secret data to the FDR SBU network. The FDR Block II configurations will be able to route data traffic between its channels without user intervention.

The Block II will serve as a means to operate a single FDR configuration across multiple frequency bands using multiple modes. Block II radios will begin the gradual displacement of legacy radios.

(3) Block III. In Block III, the objective multi-band multi-mode FDR system will complete displacing legacy radios (including FDR Block II). The system will have evolved to an open architecture design that features capabilities to be be fully configurable and programmable across several generations of technology while readily accepting technological upgrades with minimal cost and minimal impact on operational readiness.

c. <u>Operational Concept</u>.

(1) Block I. An autonomous high capacity D2 WAN formed by the FDR Block I system will serve approximately 400 brigade and divisional support elements deployed in a brigade area of operations. If practical, increased areas and/or user populations will be assimilated into an autonomous WAN. If assimilation of user nodes approaches practical limits, more than one autonomous WAN will be formed and two or more WANs will interoperate through bridges or gateways.

The Block I system will provide own position report displays at each radio and at its host device. The system will provide means and bandwidth to automatically distribute individual reports via FDR D2 WAN links to user-selected C2 automated systems for Situation Awareness (SA) processing and provide bandwidth for C2 systems to distribute SA products to appropriate elements throughout FDR D2 networks.

(2) Block II. Each Block II user radio will operate simultaneously in the FDR D2 WAN as well as in legacy networks for which it is configured. Field configurable and programmable FDRs will allow operation of a single radio unit for concurrent operations on multiple bands and multiple modes using multiple input/output devices. When operating in networks with different security levels and security policy requirements, the FDR system will require network guard functionality to mediate data transfer between the networks. Over time, the Block II system will be issued to operational elements at all organizational levels throughout the force.

(3) Block III. The Block III system will continue to operate as in Block II until eventually the legacy equipment is phased out of US forces. Networks of FDRs that can be configured and programmed on the battlefield will be the norm for US forces. The latest technological advances in hardware and software will be inserted with relative ease. As necessary, objective FDR user radios could be configured and/or programmed to operate in other military or civil networks as deemed necessary by operational elements..

(4) All Blocks. Hardware for the FDR Blocks I, II, and III systems will meet transportability and mobility requirements of the platforms on which the hardware will be installed.

Planning the FDR Blocks I, II, and III systems operations will, to some degree, involve all levels of users and communications personnel. User unit commanders and their organic communications personnel will interact to define mission needs in operational architecture terms. Unit communications personnel will, coordinate with appropriate communications planning cells, and be responsible for executing systems technical control for their respective organizations. Communications management services for the Army will be provided by the Integrated Systems Control (ISYSCON) facilities organic to the supporting signal organization. Joint control and management services will be provided by the Joint Communications Planning Management Systems (JCPMS) element of joint commands.

The FDR system shall be compatible with the Multilevel Information Systems Security Initiative (MISSI) Security Management Infrastructure to support the security management of the FDR networks and perform services such as electronic key generation and distributions, issuing of user certificates, maintaining user directories, and revoking user privileges. The FDR system shall provide services required by network security policy.

d. Support Concept. The FDR system will use standard Army maintenance and supply systems for logistical support. As a family of radios built around common components, FDR will need a smaller variety and lesser quantity of repair parts. Commonality of components will decrease complexity of training for operators as well as maintainers. Extensive built in testing (BIT) and diagnostic software will simplify the troubleshooting and fault isolation process.

e. Mission Need Statement (MNS). The FDR MNS which was validated by Headquarters Department of the Army on 13 May 96 states an urgent need for a mobile radio system that can support high capacity digital transport in all environmental conditions. Data networking capabilities must increase to keep pace with the growing need to enhance combat power with information exchange between elements on the battlefield. It is vital to reduce the complexity of the communications systems for the users. User requirements demand that the size, weight, and power draw of communications systems be reduced while increasing capability and flexibility. The FDR system will combine functions that previously required separate radios and incorporate an open system architecture with capacity for growth.

2. THREAT. The FDR system will be subject to a wide variety of threats, including electronic intercept, identification, and location determination; electronic jamming and electromagnetic pulse attacks; and threats specific to automated information system hardware, firmware, and software. Inter-systems connectivity has introduced the new high technology threat of penetration into supposedly benign networks using advanced equipment and technology. The employment of FDR at all levels of the force subject it to the full spectrum of physical attacks including sabotage and terrorist action. Since the FDR will interoperate with several existing communication systems, the specific threat to these systems also apply as outlined within their respective System Threat Assessment Reports (STARs).

3. SHORTCOMINGS OF EXISTING SYSTEMS. The existing communications equipment and methods of operation limit combat effectiveness of the force and require tactical elements to cluster around communications nodes in order to maintain effective command and control.

Space and power consumption of multiple communications systems co-located on a warfighting platform detracts from the combat effectiveness of the platform.

Current equipment suites do not apply the potential of significant technological advances in computer processing, digital modulation schemes, and physical size reductions to fulfill rapidly emerging demands for distribution and processing of integrated high-speed data, imagery, voice and video. Generally, identified performance problems include lack of interoperability between communications systems; inefficient links across cryptographic and operational boundaries; unacceptable delays in transmission of time-sensitive messages; inefficient use of bandwidth; insufficient data transport capacity; voice/data contention for system capacity; electronic interference between systems; and multi-path interference

while on the move.

Critical shortcomings of most current D2 systems is inefficient transmission of individual position reports to Situation Awareness (SA) processing systems and inefficient distribution of timely SA reports for both friendly and threat positions.

4. CAPABILITIES REQUIRED. A threshold **(T)** value is minimum performance that is necessary to satisfy operational need. An objective **(O)** value is desired performance above threshold. A Key Performance Parameter **(KPP)** is a capability or characteristic so significant that failure to meet threshold can be cause for program reevaluation, reassessment, or termination.

Unless otherwise stated below, all capabilities shall be required under applicable TRADOC Scenario conditions described for both peace and war (geographic areas, terrain, foliage, weather, user deployments, transportability, mobility, etc.).

a. FDR Block I--The Baseline Data Distribution (D2) System. The Block I system shall consist of hardware and software necessary to install, operate and maintain user radios on designated user platforms and to organize, manage, and control FDR D2 networks. Ancillaries (below) refers to such items as antenna, handset, batteries, cables,etc that are necessary to operate the FDR.

(1) Block I User Radio Basis of Issue and Interface Requirements. The FDR Block I system shall provide user radios and necessary hardware and software to interface with specified host systems and platforms identified in the FDR Operational Mode Summary Mission Profile (OMS/MP) at Annex B **(T).**

(2) Characteristics of Block I User Radios. User radios will be produced for manpack, surface vehicle, and aircraft installations in Block I. **Each user radio together with its ancillaries shall:**

(a) Fit into 100% **(T)** to 25% **(O)** of platform space allocated to comparable EPLRS and ancillaries in manpack, vehicular, or aircraft installations;

(b) Weigh 100% **(T)** to 25% **(O)** as much as comparable manpack, vehicular, or aircraft EPLRS radios and ancillaries;

(c) Draw primary power at 100% **(T)** to 25% **(O)** of the power drawn by comparable manpack, vehicular, or aircraft EPLRS radios and ancillaries;

(d) Provide electronic key generation and distribution security services using the Electronic Key Management System (EKMS), the Army Key Management System, and Integrated Systems Control (ISYSCON) components used by the Army **(T);**

(e) Retain perishable cryptographic variables for 72 hours **(T)** to 144 hours **(O)** after primary power loss and re-initialize after power restoration **(T);**

(f) Provide means for invoking local zeroization that requires at least two discrete operator actions so as to reduce the probability of accidental zeroizing **(T);**

(g) Be handled as an unclassified Controlled Cryptographic Item (CCI) when. the device that provides security is not installed in the radio **(T);**

(h) Operate within its FDR D2 network independent of control nodes after initialization and until re-keying is needed **(T);**

(i) Perform routing functions within its autonomous network **(T);**

(j) Facilitate safe, efficient and effective operation and maintenance by normal and typically trained 5th to 95th percentile personnel wearing Night Vision Devices, NBC protective equipment (MOPP 4) and

cold weather protective gear **(T);**

(k) Respect the guidance of applicable Military Standards intended to preclude or minimize exposure to health hazards and threats to soldier survivability **(T).**

(3) KEY PERFORMANCE PARAMETERS (KPP) for Block I User Radios. Each user radio together with its ancillaries shall:

(a) Be designed to meet provisions of MIL STD 461B in order to operate with full functionality and at full performance levels on the same platform with other electronic systems without degrading performance of the co-located systems **(T);**

(b) Operate successfully on vehicles moving at 50 MPH **(T);**

(c) Survive High Altitude Electromagnetic Pulse (HAEMP) and incorporate maximum practical use of materials to withstand the material damaging effects of NBC contaminants and decontaminates, including use of Chemical Agent Resistant Coating (CARC) **(T);**

(d) Have embedded capability for obtaining their own position location reports that are accurate to within 30 meters **(T)** to 3 meters **(O)** Circular Error Probable within a nominal 47 km x 47 km area;

(e) Display position reports at both radio and host system **(T);**

(f) Express position reports in Military Grid Reference System (MGRS) terms that include 3-character grid zone, 2-character 100 km square identification, and 10-digit map coordinates **(T).**

(4) Characteristics of Network Organization, Management, and Control for Block I System. The FDR Block I system shall include hardware and software sufficient to organize, manage, and dynamically control network connectivity structures, routing mechanisms, and bandwidth allocations. **The FDR Block I system shall:**

(a) Provide means to accommodate user-defined message precedence assignments and to dynamically allocate/re-allocate network capacity based on message precedence and user-defined host system priorities **(T);**

(b) Provide means to remotely distribute current and next cryptoperiod system keys over FDR circuits from control or management facilities to user radios **(T);**

(c) Provide means for invoking zeroization or selective exclusion from the network of individual radios over the air from network control facilities **(T);**

(d) Provide means, both locally and through FDR D2 network links, to effect changes to initialization, COMSEC, and TRANSEC loads of any radio in an autonomous FDR D2 network **(T);**

(e) Provide means to assess and report network link status to ISYSCON **(T);**

(f) Provide system management hardware and software in form, fit, and function that will allow direct interoperation with ISYSCON **(T);**

(g) Provide means for FDR network management facilities to program FDR nodes to automatically transmit individual position reports over the FDR network to selected FDR nodes **(T).**

(5) KEY PERFORMANCE PARAMETERS (KPP) for FDR Block I Network Organization, Management, and Control. The Block I system shall:

(a) Provide connectivity for an autonomous network of 400 **(T)** to 900 **(O)** FDR nodes tactically deployed in a nominal 20 km x 30 km area.

(b) Provide connectivity across autonomous networks for 900 **(T)** to 2000 **(O)** FDR nodes tactically deployed in a nominal 47 km x 47 km area.

(c) Provide routing service within an autonomous network for all user to user requirements including broadcasts from any FDR node to 150 **(T)** to 900 **(O)** FDR nodes.

(d) Provide means to support dynamic address changes after the network is initialized without having to reload initialization files **(T)**

(e) Provide for COMSEC and protection of data classified Secret **(T)** to Top Secret **(O).**

(f) Maintain network grade of service in autonomous networks while 10% **(T)** to 100% **(O)** of FDR nodes are simultaneously moving at speeds of at least 50 mph.

(6) KEY PERFORMANCE PARAMETERS (KPP) for Block I Data Distribution (D2). D2 requirements are developed from validated requirements documented in TRADOC Command, Control, Communications, and Computers Requirements Definition Program (C4RDP) and certain other requirements that are defined in the FDR OMS/MP at Annex B. **The FDR Block I D2 system shall satisfy the data Information Exchange Requirements (IERs) defined in the OMS/MP Attachments and shall:**

(a) Provide means to establish and sustain broadcasts at rates of 288 Kbps **(T)** to 20 Mbps**(O);**

(b) Provide means to establish and sustain point-to-point circuits to accommodate transmission of 144 kbps **(T)** to 10 mbps **(O)** while simultaneously receiving 144 kbps **(T)** to 10 mbps **(O);**

(c) In the absence of Electronic Warfare (benign) conditions, establish and sustain connectivity for 85% **(T)** to 100% **(O)** of assigned and operationally available radios in a brigade autonomous network;

(d) In benign conditions, successfully deliver 90% **(T)** to 100% **(O)** of IERs submitted to the network;

(e) In benign conditions, insure that 90% **(T)** to 100% **(O)** of delivered IERs meet Speeds Of Service (SOS) defined for IERs;

(f) Under postulated Threat electronic warfare (EW) conditions, the FDR D2 system shall establish and sustain connectivity for 70% **(T)** to 100% **(O)** of assigned and operationally available radios in a brigade autonomous network;

(g) Under EW conditions, successfully deliver 90% **(T)** to 100% **(O)** of IERs submitted to the network;

(h) Under EW conditions, ensure that 90% **(T)** to 100% **(O)** of delivered IERs meet three times **(T)** to one time **(O)** the Speeds of Service (SOS).

(7) Block I Logistics and Readiness. The FDR system will be supported by standard supply and maintenance systems. **Each FDR Block I user radio shall:**

(a) Provide operator level power-up Built-In-Test (BIT) capability for testing to determine if radio is functional **(T);**

(b) Without operator intervention, report BIT faults during operations with an audible alarm and visual displays at both radio and attached host**(T);**

(c) Provide operator controls to adjust and/or disable BIT audio and visual alarms at the radio **(T)** and from the attached host **(O);**

(d) Provide unit level maintainer level off-line BIT to detect failures/out of tolerance conditions to the

Line Replaceable Unit (LRU) level without need for extensive test, measurement, and diagnostic equipment **(T);**

(e) Provide direct support level maintenance mode for fault isolation to the Shop Replaceable Unit level **(T);**

(f) Display faults detected by off-line BIT in simple failure codes **(T)**;

(g) Be transportable on its host platform without degrading the host transportability qualification **(T);**

(h) Meet reliability measures of (TBD) hours **(T)** to (TBD) hours **(O)** Mean Time Between Operational Mission Failure (MTBOMF);

(i) Meet Operational Availability (Ao) factors of (TBD) **(T)** to (TBD) **(O);**

(j) Be maintainable at a maintenance ratio of (TBD) **(T)**.

b. FDR Block II--The Transitional Multi-Band Multi-Mode System. The FDR Block II system will be multi-modal and operate on Block I D2 nets as well as emulating other legacy radios and modes on legacy nets. Unless explicitly stated below, all functionality and requirements of the FDR Block I system shall be incorporated into the FDR Block II system.

(1) Block II System Components. The FDR block II system shall consist of all hardware and software components necessary to install, operate and maintain user radios on designated platforms and to organize, manage, and control FDR D2 network(s)**(T).**

(2) Block II User Radio Basis of Issue and Interface Requirements. The FDR Block II system shall be installed, operated, and maintained on platforms and for host systems specified at Attachments **(T).**

(3) Block II System Integration with Hosts. The FDR Block II system shall accommodate use of existing host hardware and software configurations and shall provide input/output devices for unique FDR modal requirements that can not be effectively and efficiently met by existing and/or standard devices **(T).**

(4) Characteristics of Block II User Radios--All Configurations and Installations. Within the context of the OMS/MP and together with their ancillaries, **FDR Block II user radios shall:**

(a) Fit into 100% **(T)** to 25% **(O)** of platform space allocated to the radio(s) and their ancillaries, that the configuration will displace;

(b) Weigh 100% **(T)** to 25% **(O)** as much as the radio(s) and their ancillaries that the configuration will displace;

(c) Draw primary power at 100% **(T)** to 25% **(O)** of the power drawn by the radio(s) and their ancillaries that the configuration will displace.

(5) Block II User Radios--Hand Held Design. The OMS/MP defines FDR hand held user radio configurations and required interface to hosts. Below are required capabilities specifically for FDR hand held radios. **Each hand held radio shall:**

(TBD)

(6) Block II User Radios--Manpack Installation. The OMS/MP defines FDR manpack radio configurations and required interface to hosts. Below are required capabilities specifically for FDR Block II manpack radios. **Each manpack radio shall: (TBD)**

(7) Block II User Radios--Surface Vehicle Installations. The OMS/MP defines FDR surface vehicle

radio configurations, required interface to hosts, platforms, and operational facilities. Below are required capabilities specifically for FDR Block II surface vehicle radio installations. **Each radio installed on surface vehicles shall:**

(TBD)

(8) Block II User Radios--Aircraft Installations. The OMS/MP defines FDR aircraft radio configurations, required interface to hosts, platforms, and operational facilities. Below are required capabilities specifically for FDR Block II aircraft radio installations. **Each radio installed on air vehicles shall:**

(TBD)

(9) KEY PERFORMANCE PARAMETERS (KPP) for Block II User Radios. Within the context of the OMS/MP and together with their ancillaries, **FDR Block II user radios shall:**

(a) Meet the performance standards of FDR Block I D2 System while simultaneously operating on other assigned networks**(T);**

(b) Be configurable in the field for FDR combinations defined at Attachments **(T)** and for future combinations that may emerge during the FDR life cycle **(O);**

(c) Simultaneously operate assigned band and mode configuration without electromagnetic interference between the configured systems **(T)**;

(d) Emulate legacy radios of assigned configuration to the extent that the FDR configuration directly interoperates in its assigned network(s) without need to modify participating legacy radio(s), assigned host system(s), or host system operating procedures **(T);**

(e) Provide level(s) of performance at least the same **(T)** or better than **(O)** the legacy radio(s) being emulated.

(10) Characteristics of Block II System Control, Management, and Network Services. The FDR Block II system shall:

(a) Provide for Block II multi-band radios to be capable of being controlled by legacy network control stations **(T)**;

(b) Provide control and management services for FDR networks **(T);**

(c) Provide capabilities for each Block II radio, after initialization in the data network(s) for which it is configured, to perform dynamic intra-network and inter-network routing for data transport based on priority and availability of bandwidth on the networks **(T).**

(11) KEY PERFORMANCE PARAMETERS (KPP) for Block II Data and Voice Information Exchange Requirements (IER). The OMS/MPdefines data and voice IER between operational facilities (OPFACs), their host systems, and legacy communications equipment assigned to each OPFAC. **For designated OPFACs, configurations, and networks, the FDR Block II system shall:**

(a) Satisfy FDR Block I data IERs identified for the OPFAC served by the FDR configuration **(T);**

(b) Satisfy FDR Block II data IERs identified for the legacy equipment being emulated by the FDR configuration **(T);**

(c) Perform functions within each user radio to route data messages between FDR D2 network(s) and legacy D2 network(s) for which user radios are configured **(T);**

(d) Satisfy voice IERs identified for the OPFAC and legacy equipment being emulated by the FDR configuration **(T).**

(12) Block II Logistics and Readiness. Block II radios shall: (TBD)

c. FDR Block III--The Objective Multi-Band Multi-Mode System. Within the context of the configurations defined at the OMS/MP, the FDR Block III user radios and ancillaries shall:

(1) Be configurable and/or programmable to operate multiple selected modes on multiple selected bands in the radio frequency range from 2 MHz to 2 GHz **(T);**

(2) Provide levels of performance the same **(T)** or better **(O)** than like configurations of Block II radios and ancillaries;

(3) Fit into 100% **(T)** to 25% **(O)** of platform space allocated to like configurations of Block II radios and ancillaries;

(4) Weigh 100% **(T)** to 25% **(O)** as much as like configurations of Block II radios and ancillaries; and

(5) Draw primary power at 100% **(T)** to 25% **(O)** of the power drawn by like configurations of Block II radios and ancillaries.

5. PROGRAM SUPPORT.

a. Maintenance Planning. FDR maintenance will be performed at Unit Level (UL), Direct Support (DS) and Depot levels. Some associated standard items may require GS as specified by established policy for those items.

(1) FDR Block I User Radio Maintenance. Operators will be any designated soldier i.e. General Purpose Users (GPU). Unit Level (UL) maintainers will perform preventive maintenance checks and services; use BITE and organic TMDE for fault isolation to Line Replaceable Unit level; remove LRU; exchange for float at DS; and replace LRU with float. Direct support maintainers will stock LRU/SRU spares; use BITE and organic TMDE for LRU fault isolation to SRU level; remove/replace SRUs; and evacuate SRU/ LRU through usual channels to Depot. UL, DS and Depot maintainer specialties will be identified through the Qualitative, Quantitative, Personnel Requirements Information (QQPRI) process.

(2) FDR Block II and III User Radio Maintenance. Assignment of Block II and III radio operators and maintainers will be based on the complexity of the FDR configurations of legacy radio emulation and their operating procedures. Block II and III radios will be operated by the same operators now designated for the legacy systems being emulated. The UL, DS and Depot maintainer specialties will be identified through the QQPRI process. Tasks for Block II and III radio maintainers will essentially be the same tasks as for Block I radio maintainers.

(3) Depot Maintenance for FDR Equipment. At Depot, assigned maintainers will use organic TMDE to fault isolate certain LRUs/SRUs to piece part level; repair piece-parts; and overhaul FDR components.

(4) Communications Security (COMSEC) Equipment Maintenance. Operators and UL maintainers of FDR components will also operate and perform UL maintenance for associated COMSEC equipment. UL maintainers will initiate go/no go tests and replace batteries and fuses. The designated DS maintainer for associated COMSEC equipment will replace certain faulty COMSEC items and evacuate the items to the appropriate Depot as specified by Depot Interservice Support Agreements between Army, Navy and/or Air Force components. Evacuation of items will be through COMSEC Material Control System or normal channels, as appropriate for each item. Depot maintainers will fault isolate COMSEC items to SRU level; remove/replace and repair certain SRU; forward certain components or SRUs to vendors for repair; and certify/re-certify items where applicable.

(5) Contractor Maintenance. Until attaining its Initial Operational Capability (IOC) contractor maintenance of FDR hardware/software is anticipated.

(6) Software Maintenance. Post Development Software Support will be performed under the direction of US Army Communications Electronics Command, Fort Monmouth, NJ.

(7) Logistical Support Organizations. Standard support relationships apply to units equipped with FDR.

b. Support Equipment. FDR will have BIT/BITE and be supported by standard TMDE. Required support equipment/TMDE will be identified at maintenance allocation charts within applicable technical manuals.

c. Human Systems Integration.

(1) Training.

(a) Instructor and Key Personnel (IKP) Training. Contractors will conduct radio operator/maintainer and system manager IKP training at contractor facilities.

(b) Player Training for Initial Operational Test and Evaluation (IOTE). Instructors from the US Army Signal Center (USASC) will train FDR system managers, system planners and radio set maintainers. Test unit cadre will be trained for radio set operation by USASC instructors; then the cadre will train other test unit operators using exportable training packages.

(c) New Equipment Training Teams (NETT). The IOTE unit will become the First Unit Equipped (FUE) after IOTE, therefore only reduced NET is required. For fielding after FUE, CECOM NETTs will conduct on-site training.

(d) Doctrine and Tactics Training (DTT). Upon receipt of the contractor developed training materials, the TRADOC schools will develop training materials for tactics, techniques and procedures. The training will be provided to the commanders and selected staff receiving the new system. The unit commander will ensure that additional personnel are trained to operate and maintain the system. The training will encompass the changes in unit tactics as a result of the system fielding, the availability of training materials, and how to implement the training. The TTP will be delivered by CECOM NETT, TNET, or printed media. The TRADOC schools will integrate DTT into appropriate courses and doctrinal publications to support sustaining DTT.

(e) Institutional Training. The contractor developed training materials for institutional training will be based on task and skills analysis using the System Approach to Training. Institutional training for operator and maintenance critical tasks will be based on the contractor developed programs of instructions, lesson plans, slides, handouts, performance examinations, and technical manuals. Training will consist of operator, unit level, and direct support maintenance. The Ordnance School located at the Signal Center, will provide direct support maintenance training.

(f) Unit Sustainment Training. The unit commander will select trainer personnel to be trained by CECOM NETT. The trainers will then use the training packages to proliferate and sustain training throughout the unit.

(g) Training Devices. No unique training devices will be required for FDR operators, maintainers, or system level managers and planners. As applicable, existing devices for training of legacy systems will be used to support FDR training.

(h) Peacetime Training Constraints. In certain geographic areas, training with active FDR networks will require coordination to reduce the potential for interference with essential operating systems in the area.

(2) Force Structure. The program objective is to operate within the current Army manpower structure. No new Military Occupational Specialty (MOS), Additional Skill Identifier (ASI) or increased skill levels will be required compared to those now operating and maintaining predecessor systems. FDR is intended as a General Purpose User (GPU) equipment.

(3) Human Engineering. FDR design, to include controls, displays, configuration, required operating procedures, and operating environment, will minimize (preclude desired) human performance errors, interface problems, and workload (physical and cognitive) requirements. The user interface should be uncomplicated and respect appropriate guidance contained in MIL STD 1472 which support ease of operation.

(4) Safety and Health Hazards. The FDR will be designed to respect all applicable safety and health standards so as to minimize (preclude desired) risks associated with operating or maintaining the radio. Particular emphasis will be focused on minimizing risks of shock, RF exposure, and battery venting or leakage.

(5) Soldier (User) Survivability. FDR operation, maintenance, repair, and support requirements should not increase risk to associated personnel related to detection, likelihood of targeting or attack, or likelihood of injury if attacked.

(6) Manpower and Personnel Integration (MANPRINT). MANPRINT, as the integration of preceding considerations, will influence total system performance: it is the impact of the user on systems effectiveness,. ?Appropriate MANPRINT issue and concerns will be reflected in the Critical Operational Issues and Criteria (COIC) and specifically addressed in both research and development activities and in test and evaluation efforts.

d. Computer Resources. It is required that FDR provide means for ISYSCON to have access to FDR databases. The FDR network management terminal and ISYSCON will have automated interface through FDR links for transfer of planning, engineering, deployment, and system configuration data for FDR networks.

e. Other Logistics Considerations. The initial provisioning process will be IAW MIL-STD-1388-2A. Full provisioning will be IAW the LSA/LSAR process. There are no unique facility, shelter, or special transportation requirements. No unique engineering data or technical orders are required for depot support. It is required that FDR components/parts be unclassified when not keyed, but some FDR components/parts may be designated Controlled Cryptographic Items and will require appropriate handling during maintenance and supply actions.

f. Command, Control, Communications, and Intelligence (C3I). FDR will be designed to allow direct interface with ABCS sub-systems of all BFAs through appropriate protocols. FDR Block II and III radios are designed to directly interface with certain other communications systems as defined at Attachments. Interoperability with other systems may be achieved through Battlefield Automated Systems that are compatible with both systems or through certain internetwork protocols. FDR will not require unique data, computer network, or intelligence support.

g. Transportation and Basing. Radio Sets will be transported on host platforms without degradation of host system transportability. There will be no restrictions for road, rail, sea, or air movement when FDR components are configured for movement as specified in technical manuals. FDR components will be assigned to standard organizations and will require no special basing or training locations.

h. Standardization, Interoperability, and Commonality.

(1) Standardization. To realize economy of scale savings in development and sustaining FDR, the system will be designed with standard commercial components where feasible. Open architecture design using standard commercial and military protocols will facilitate efficient and cost effective changes to system hardware and software as new technology mandates displacement of older legacy equipment and operational methods.

(2) Interoperability. Interoperability is addressed for host/radio, radio/network, and network/management levels for FDR Blocks I, II, and III.

(a) User Interface to FDR Radios. Manual interface between user personnel and FDR will be via input/output devices appropriate to the band and mode being used. Automated interoperability between automated systems and FDRs will be through physical interconnection between FDRs and host systems.

(b) FDR Interface to Networks. All radios in FDR networks will have direct automated interface via FDR radio links. FDR radios operating in legacy networks will have direct radio link interface with the legacy networks for which the FDR is configured.

(c) Network Management Interface. The FDR system will provide network management tools that are compatible with ISYSCON and interface with the FDR network through FDR radio links.

(3) Commonality. The FDR Block I system will establish a data distribution network that will set the baseline for interface in designing new data systems. The Block II system will retain the baseline and incorporate legacy radio capabilities to accommodate the long-term transition of the entire force to a single family of radios that are configurable and programmable for multi-band multi-mode operations. The FDR Block III system will be configurable and programmable to emulate former, current, and future modes across the range of 2 MHz to 2 GHz.

i. Mapping, Charting, and Geodesy Support. Organizations equipped with FDR will require Defense Mapping Agency digitized map libraries for anticipated areas of operation and training. In most cases, a unit needs only one map library to support FDR as well as other systems. Digitized map libraries will usually be maintained by supporting signal unit ISYSCONs.

j. Environmental Support. No unique support is required for FDR.

6. Force Structure.

a. Equipment. Total force equipment quantities are dependent on unit multipliers.

(1) FDR Block I. Estimated FDR Block I radio and Network Management Terminal (NMT) densities (including operational readiness floats) per type unit are:

HVY AA ABN LT SEP PDSS, DEPOT,

CORPS DIV DIV DIV DIV BDE ACR & TRNG BASE

Radio 100 900 800 700 700 300 300 300

NMT 4 8 8 8 8 4 4 10

(2) FDR Block II. TBD

(3) FDR Block III. TBD

(4) War Reserves. TBD

b. Personnel Impact. As older equipment is phased out and displaced by FDR equipment, a net decrease in maintenance personnel requirements should occur due to the commonality of equipment repair tasks and the proliferation of common radios. Some increase to management and planning personnel authorizations may be necessary but are expected to be offset by larger decreases in technical control personnel currently required by some legacy systems.

Specific impacts are TBD.

7. SCHEDULE CONSIDERATIONS.

a. Operational Capabilities.

(1) Block I Initial Operational Capability (IOC). Block I IOC will be attained when all Block I threshold (T) capabilities at paragraph 4 are met; the first brigade-sized unit is fully equipped with authorized equipment and personnel; new equipment training has been completed; training materials to support institutional and unit sustaining training are in place; and facilities for specified levels of supply and maintenance are in place.

(2) Block I Full Operational Capability (FOC). Block I FOC will be attained when all Block I objective (O) capabilities have been met and all Block I equipment has been retrofitted and fielded to authorized units.

(3) FDR Block II IOC. Block II IOC will be attained when all Block II threshold (T) capabilities at paragraph 4 are met; the first brigade-sized unit is equipped with authorized equipment to displace designated legacy systems; appropriate personnel are assigned to the unit; new equipment training has been completed; Block II radios have been integrated into the communications architecture of the brigade; training materials to support institutional and unit sustaining training are in place; and facilities for specified levels of supply and maintenance are in place.

(4) FDR Block II FOC. Block II FOC will be attained when all Block II objective (O) capabilities at paragraph 4 have been met and all Block II equipment has been retrofitted for objective capabilities and fielded to authorized units.

(5) FDR Block III IOC. Block III IOC will be attained when all Block III threshold (T) capabilities at paragraph 4 are met; the first brigade-sized unit is equipped with a full complement of FDR equipment and personnel; new equipment training has been completed; all designated legacy radios have been displaced by FDR: training materials to support institutional and unit sustaining training are in place; and facilities for specified levels of supply and maintenance are in place.

(6) FDR Block III FOC. Block III FOC will be attained when all objective (O) capabilities at paragraph 4 have been met and all Block III equipment has been retrofitted for objective capabilities and fielded to authorized units.

b. Milestone Schedule.

Block I Block II Block III

IOTE 1Q FY 00 3Q FY 02 TBD

IOC 4Q FY 00 1Q FY 04 TBD

FOC TBD TBD TBD

c. Impact of Schedule Delay. Delay in the FDR schedule will have major negative consequences on the success of battlefield digitization efforts to the extent that full and timely use of digitized platforms depend on timely of the FDR transport system.

(1) Block I. Delay in fielding the Block I FDR D2 system will result in not meeting brigade and below data transport requirements and efficient and effective means for user position location data to be distributed to Situation Awareness (SA) processing centers and for SA reports to be distributed to interested users.

(2) Block II. Delay in fielding the FDR Block II multi-band multi-mode system will prolong battlefield deficiencies such as lack of interoperable communications systems, lack of commonality in equipment

components, and inefficiencies in linking forces for effective Command and Control.

(3) **Block III.** Delay in fielding the FDR Block III objective system will prolong the need for excessive costs of logistics support for several families of radios, including their excessive consumption of precious platform space, weight, and power. Delay in fielding will also delay attainment of full interoperability between component, joint, and allied forces as well as other military and civil organizations.

ANNEX A RATIONALE to the OPERATIONAL REQUIREMENTS DOCUMENT (ORD) for the FUTURE DIGITAL RADIO (FDR)

To be published.

ANNEX B OPERATIONAL MODE SUMMARY/MISSION PROFILE to the OPERATIONAL REQUIREMENTS DOCUMENT (ORD) for the FUTURE DIGITAL RADIO (FDR)

To be published.

EXAMPLE ONLY--ANNEX B Attachment 1: FDR Block I Basis of Issue (TBD)

RULE OPFAC SRC/TITLE PLATFORM HOSTS

A8811 AR Bn S-3 17376L000 HHC, Tank Bn M-577 FBCB2, ASAS

IB280 Co TOC 07017L000 Rifle Co, IN Bn (Lt) HMMWV Appliqué

IG201 Scout 07016l000 HHC, IN Bn(Lt) Manpack DSSU

UI20A AQF ACFT 01118L000 Cmd Avn Co EH-60 AQF

EXAMPLE ONLY--ANNEX B Attachment 2: FDR Information Exchange Requirements (TBD)

1. FDR Block I Data Information Exchange Requirements (IER)

a. Data IER Documented in C4RDP.

COMM COMM MSG/ BITS/ SOS

SENDER HOST EQUIP RCVR HOST EQUIP HOUR MSG (secs)

Bde FSE AFATDS EPLRS Bn FSE AFATDS EPLRS 2 648 10

Bn FSE AFATDS EPLRS Bde FSE AFATDS EPLRS 1 72 10

b. Data IER Estimated for Emerging Systems.

c. Data IER Estimated for Capacity Growth.

2. FDR Block II Data Information Exchange Requirements (IER)

3. FDR Block II Voice Information Exchange Requirements.

a. Voice IER Documented in C4RDP.

b. Voice IER Estimated for Emerging Systems.

c. Voice IER Estimated for Capacity Growth

EXAMPLE ONLY----------ANNEX B Attachment 3: FDR Block II Multi-band Multi-Mode Configurations

MODES FOR ALL CONFIGURATIONS

FDR BLOCK I DATA

POSITION LOCATION DATA

MODES TO BE CONSIDERED

SINCGARS data & voice; HF data & voice; JTIDS data & voice; MIDS data & voice; SATCOM data & voice; MSRT data & voice; JTT data & voice; EPLRS data; and others

----------EXAMPLE ONLY----------

ANNEX C

COORDINATION

to the

OPERATIONAL REQUIREMENTS DOCUMENT (ORD)

for the

FUTURE DIGITAL RADIO (FDR)

To be published.

ANNEX D

FUNDING IMPLICATIONS

to the

OPERATIONAL REQUIREMENTS DOCUMENT (ORD)

for the

FUTURE DIGITAL RADIO (FDR)

To be published.

ANNEX E

TRAINING DEVICES

to the

OPERATIONAL REQUIREMENTS DOCUMENT (ORD)

for the

FUTURE DIGITAL RADIO (FDR)

To be published.

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